



Seq Listing 2-7-07.txt

<110> APPLICANT: National Renewable Energy Laboratory
<120> TITLE OF INVENTION: Cellobiohydrolase I Gene and Improved Variants
<130> FILE REFERENCE: NREL 99-45
<140> CURRENT APPLICATION NUMBER: US/10/031,496D
<141> CURRENT FILING DATE: 2002-01-14
<160> NUMBER OF SEQ ID NOS: 96
<170> SOFTWARE: PatentIn version 3.3

<210> SEQ ID NO 1
<211> LENGTH: 28
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 1
agagagtcta gacacggagc ttacaggc 28

<210> SEQ ID NO 2
<211> LENGTH: 35
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 2
aaagaagcgc ggccgcgcct gcactctcca atcgg 35

<210> SEQ ID NO 3
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 3
ggcggaaacc cgctggcac cacc 24

<210> SEQ ID NO 4
<211> LENGTH: 1551
<212> TYPE: DNA
<213> ORGANISM: Trichoderma reesei
<220> FEATURE:
<221> NAME/KEY: CDS
<222> LOCATION: (1)..(1545)
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (1)..(51)
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (52)..(1344)
<220> FEATURE:
<221> NAME/KEY: misc_binding
<222> LOCATION: (1436)..(1550)
<400> SEQUENCE: 4
atg tat cgg aag ttg gcc gtc atc tcg gcc ttc ttg gcc aca gct cgt 48
Met Tyr Arg Lys Leu Ala Val Ile Ser Ala Phe Leu Ala Thr Ala Arg
1 5 10 15
gct cag tcg gcc tgc act ctc caa tcg gag act cac ccg cct ctg aca 96
Ala Gln Ser Ala Cys Thr Leu Gln Ser Glu Thr His Pro Leu Thr
20 25 30
tgg cag aaa tgc tcg tct ggt ggc acg tgc act caa cag aca ggc tcc 144
Trp Gln Lys Cys Ser Ser Gly Gly Thr Cys Thr Gln Gln Thr Gly Ser
35 40 45
gtg gtc atc gac gcc aac tgg cgc tgg act cac gct acg aac agc agc 192
Val Val Ile Asp Ala Asn Trp Arg Trp Thr His Ala Thr Asn Ser Ser

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50	55	60	
acg aac tgc tac gat ggc aac act tgg agc tcr acc cta tgt cct gac	Thr Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp		240
65	70	75	80
aac gag acc tgc gcg aag aac tgc tgt ctg gac ggt gcc gcc tac gcg	Asn Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala		288
85	90	95	
tcc acg tac gga gtt acc acg agc ggt aac agc ctc tcc att ggc ttt	Ser Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe		336
100	105	110	
gtc acc cag tct gcg cag aag aac gtt ggc gct cgc ctt tac ctt atg	Val Thr Gln Ser Ala Gln Lys Asn Val Gly Ala Arg Leu Tyr Leu Met		384
115	120	125	
gcg agc gac acg acc tac cag gaa ttc acc ctg ctt ggc aac gag ttc	Ala Ser Asp Thr Thr Tyr Gln Glu Phe Thr Leu Gly Asn Glu Phe		432
130	135	140	
tct ttc gat gtt gat gtt tcg cag ctg ccg tgc ggc ttg aac gga gct	Ser Phe Asp Val Asp Val Ser Gln Leu Pro Cys Gly Leu Asn Gly Ala		480
145	150	155	160
ctc tac ttc gtg tcc atg gac gcg gat ggt ggc gtg agc aag tat ccc	Leu Tyr Phe Val Ser Met Asp Ala Asp Gly Gly Val Ser Lys Tyr Pro		528
165	170	175	
acc aac acc gct ggc gcc aag tac ggc acg ggg tac tgt gac agc cag	Thr Asn Thr Ala Gly Ala Lys Tyr Gly Thr Gly Tyr Cys Asp Ser Gln		576
180	185	190	
tgt ccc cgc gat ctg aag ttc atc aat ggc cag gcc aac gtt gag ggc	Cys Pro Arg Asp Leu Lys Phe Ile Asn Gly Gln Ala Asn Val Glu Gly		624
195	200	205	
tgg gag ccg tca tcc aac aac gcg aac acg ggc att gga gga cac gga	Trp Glu Pro Ser Ser Asn Asn Ala Asn Thr Gly Ile Gly Gly His Gly		672
210	215	220	
agc tgc tgc tct gag atg gat atc tgg gag gcc aac tcc atc tcc gag	Ser Cys Cys Ser Glu Met Asp Ile Trp Glu Ala Asn Ser Ile Ser Glu		720
225	230	235	240
gct ctt acc ccc cac cct tgc acg act gtc ggc cag gag atc tgc gag	Ala Leu Thr Pro His Pro Cys Thr Thr Val Gly Gln Glu Ile Cys Glu		768
245	250	255	
ggt gat ggg tgc ggc gga act tac tcc gat aac aga tat ggc ggc act	Gly Asp Gly Cys Gly Gly Thr Tyr Ser Asp Asn Arg Tyr Gly Gly Thr		816
260	265	270	
tgc gat ccc gat ggc tgc gac tgg aac cca tac cgc ctg ggc aac acc	Cys Asp Pro Asp Gly Cys Asp Trp Asn Pro Tyr Arg Leu Gly Asn Thr		864
275	280	285	
agc ttc tac ggc cct ggc tca agc ttt acc ctc gat acc acc aag aaa	Ser Phe Tyr Gly Pro Gly Ser Ser Phe Thr Leu Asp Thr Thr Lys Lys		912
290	295	300	
ttg acc gtt gtc acc cag ttc gag acg tcg ggt gcc atc aac cga tac	Leu Thr Val Val Thr Gln Phe Glu Thr Ser Gly Ala Ile Asn Arg Tyr		960
305	310	315	320
tat gtc cag aat ggc gtc act ttc cag cag ccc aac gcc gag ctt ggt	Tyr Val Gln Asn Gly Val Thr Phe Gln Gln Pro Asn Ala Glu Leu Gly		1008
325	330	335	
agt tac tct ggc aac gag ctc aac gat gat tac tgc aca gct gag gag	Ser Tyr Ser Gly Asn Glu Leu Asn Asp Asp Tyr Cys Thr Ala Glu Glu		1056
340	345	350	
gca gaa ttc ggc gga tcc tct ttc tca gac aag ggc ggc ctg act cag	Ala Glu Phe Gly Gly Ser Ser Phe Ser Asp Lys Gly Gly Leu Thr Gln		1104
355	360	365	
ttc aag aag gct acc tct ggc ggc atg gtt ctg gtc atg agt ctg tgg	Phe Lys Lys Ala Thr Ser Gly Gly Met Val Leu Val Met Ser Leu Trp		1152
370	375	380	
gat gat tac tac gcc aac atg ctg tgg ctg gac tcc acc tac ccg aca	Asp Asp Tyr Tyr Ala Asn Met Leu Trp Leu Asp Ser Thr Tyr Pro Thr		1200

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385	aac gag acc tcc tcc	390	aca ccc ggt gcc gtg cgc gga agc tgc tcc acc	400	1248
Asn Glu Thr Ser	405	Thr Pro Gly Ala Val Arg Gly Ser Cys Ser Thr	410	415	
agc tcc ggt gtc cct gct cag gtc gaa tct cag tct ccc aac gcc aag	420	425	430	435	1296
Ser Ser Gly Val Pro Ala Gln Val Glu Ser Gln Ser Pro Asn Ala Lys					
gtc acc ttc tcc aac atc aag ttc gga ccc att ggc agc acc ggc aac	435	440	445		1344
Val Thr Phe Ser Asn Ile Lys Phe Gly Pro Ile Gly Ser Thr Gly Asn					
cct agc ggc ggc aac cct ccc ggc gga aac ccg cct ggc acc acc acc	450	455	460		1392
Pro Ser Gly Gly Asn Pro Pro Gly Gly Asn Pro Pro Gly Thr Thr Thr					
acc cgc cgc cca gcc act acc act gga agc tct ccc gga cct acc cag	465	470	475	480	1440
Thr Arg Arg Pro Ala Thr Thr Thr Gly Ser Ser Pro Gly Pro Thr Gln					
tct cac tac ggc cag tgc ggc ggt att ggc tac agc ggc ccc acg gtc	485	490	495		1488
Ser His Tyr Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val					
tgc gcc agc ggc aca act tgc cag gtc ctg aac cct tac tac tct cag	500	505	510		1536
Cys Ala Ser Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln					
tgc ctg taa agctcc					1551
Cys Leu					

<210> SEQ ID NO 5

<211> LENGTH: 514

<212> TYPE: PRT

<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 5

Met Tyr Arg Lys Leu Ala Val Ile Ser Ala Phe Leu Ala Thr Ala Arg	
1 5 10 15	
Ala Gln Ser Ala Cys Thr Leu Gln Ser Glu Thr His Pro Pro Leu Thr	
20 25 30	
Trp Gln Lys Cys Ser Ser Gly Gly Thr Cys Thr Gln Gln Thr Gly Ser	
35 40 45	
Val Val Ile Asp Ala Asn Trp Arg Trp Thr His Ala Thr Asn Ser Ser	
50 55 60	
Thr Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp	
65 70 75 80	
Asn Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala	
85 90 95	
Ser Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe	
100 105 110	
Val Thr Gln Ser Ala Gln Lys Asn Val Gly Ala Arg Leu Tyr Leu Met	
115 120 125	
Ala Ser Asp Thr Thr Tyr Gln Glu Phe Thr Leu Leu Gly Asn Glu Phe	
130 135 140	
Ser Phe Asp Val Asp Val Ser Gln Leu Pro Cys Gly Leu Asn Gly Ala	
145 150 155 160	
Leu Tyr Phe Val Ser Met Asp Ala Asp Gly Val Ser Lys Tyr Pro	
165 170 175	
Thr Asn Thr Ala Gly Ala Lys Tyr Gly Thr Gly Tyr Cys Asp Ser Gln	
180 185 190	
Cys Pro Arg Asp Leu Lys Phe Ile Asn Gly Gln Ala Asn Val Glu Gly	
195 200 205	
Trp Glu Pro Ser Ser Asn Asn Ala Asn Thr Gly Ile Gly Gly His Gly	
210 215 220	
Ser Cys Cys Ser Glu Met Asp Ile Trp Glu Ala Asn Ser Ile Ser Glu	
225 230 235 240	
Ala Leu Thr Pro His Pro Cys Thr Thr Val Gly Gln Glu Ile Cys Glu	
245 250 255	
Gly Asp Gly Cys Gly Gly Thr Tyr Ser Asp Asn Arg Tyr Gly Gly Thr	

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      260      265      270
Cys Asp Pro Asp Gly Cys Asp Trp Asn Pro Tyr Arg Leu Gly Asn Thr
      275      280      285
Ser Phe Tyr Gly Pro Gly Ser Ser Phe Thr Leu Asp Thr Thr Lys Lys
      290      295      300
Leu Thr Val Val Thr Gln Phe Glu Thr Ser Gly Ala Ile Asn Arg Tyr
      305      310      315
Tyr Val Gln Asn Gly Val Thr Phe Gln Gln Pro Asn Ala Glu Leu Gly
      320      325      330
Ser Tyr Ser Gly Asn Glu Leu Asn Asp Tyr Cys Thr Ala Glu Glu
      335      340      345
Ala Glu Phe Gly Gly Ser Ser Phe Ser Asp Lys Gly Gly Leu Thr Gln
      350      355      360
Phe Lys Lys Ala Thr Ser Gly Gly Met Val Leu Val Met Ser Leu Trp
      365      370      375
Asp Asp Tyr Tyr Ala Asn Met Leu Trp Leu Asp Ser Thr Tyr Pro Thr
      380      385      390
Asn Glu Thr Ser Ser Thr Pro Gly Ala Val Arg Gly Ser Cys Ser Thr
      395      400      405
Ser Ser Gly Val Pro Ala Gln Val Glu Ser Gln Ser Pro Asn Ala Lys
      410      415      420
Val Thr Phe Ser Asn Ile Lys Phe Gly Pro Ile Gly Ser Thr Gly Asn
      425      430      435
Pro Ser Gly Gly Asn Pro Pro Gly Gly Asn Pro Pro Gly Thr Thr Thr
      440      445      450
Thr Arg Arg Pro Ala Thr Thr Thr Gly Ser Ser Pro Gly Pro Thr Gln
      455      460      465
Ser His Tyr Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val
      470      475      480
Cys Ala Ser Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln
      485      490      495
Cys Leu
      500      505      510

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<210> SEQ ID NO 6
<211> LENGTH: 45
<212> TYPE: DNA
<213> ORGANISM: Artificial
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<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 6
cctcccggcg gaaacccgcc tggcaccacc accacccgcc gccca

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45

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<210> SEQ ID NO 7
<211> LENGTH: 32
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 7
ggactcacgc tacggccagc agcacgaact gc

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32

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<210> SEQ ID NO 8
<211> LENGTH: 36
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 8
cccataccgc ctgggcgcca ccagcttcta cggccc

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36

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<210> SEQ ID NO 9
<211> LENGTH: 41
<212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 9
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<210> SEQ ID NO 10
 <211> LENGTH: 26
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 10
 gcactctcca atcggagact cacccg 26

<210> SEQ ID NO 11
 <211> LENGTH: 26
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 11
 gcactctcca accggagact cacccg 26

<210> SEQ ID NO 12
 <211> LENGTH: 26
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Synthetic
 <400> SEQUENCE: 12
 cgggtgagtc tccggttgga gagtgc 26

<210> SEQ ID NO 13
 <211> LENGTH: 28
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 13
 ggcacgtgca ctcaacagac aggctccg 28

<210> SEQ ID NO 14
 <211> LENGTH: 28
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 14
 ggcacgtgca ctccacagac aggctccg 28

<210> SEQ ID NO 15
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 15
 cggagcctgt ctgtggagtg cacgtgcc 28

<210> SEQ ID NO 16
 <211> LENGTH: 32
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 16
 ggcgctggac tcacgctacg aacagcagca cg 32

<210> SEQ ID NO 17
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 <213> ORGANISM: Artificial
 <220> FEATURE:
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 cgtgctgctg ttcgtagggt gagtccagcg cc 32

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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 18
 gctgtctgga cggtgccgcc tacgcg 26

<210> SEQ ID NO 19
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 19
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<210> SEQ ID NO 20
 <211> LENGTH: 26
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
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 gctgtctgga ccctgccgcc tacgcg 26

<210> SEQ ID NO 21
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 <212> TYPE: DNA
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 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 21
 cgcgtaggcg gcagggtcca gacagc 26

<210> SEQ ID NO 22
 <211> LENGTH: 24
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 22
 gcctctccat tggctttgtc accc 24

<210> SEQ ID NO 23
 <211> LENGTH: 24
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 23
 gcctctccat tccctttgtc accc 24

<210> SEQ ID NO 24
 <211> LENGTH: 24
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer rfor PCR
 <400> SEQUENCE: 24
 gggtgacaaa gggaatggag aggc 24

<210> SEQ ID NO 25
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 25
 ggccaacggt gagggctggg agcc 24

<210> SEQ ID NO 26
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 <212> TYPE: DNA
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 26
 ggccaacggt ccgggctggg agcc 24

<210> SEQ ID NO 27
 <211> LENGTH: 24
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 27
 ggctcccagc ccggaacggt ggcc 24

<210> SEQ ID NO 28
 <211> LENGTH: 27
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 28
 ggctgggagc cgtcatccaa caacgcg 27

<210> SEQ ID NO 29
 <211> LENGTH: 27
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 29
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<210> SEQ ID NO 30
 <211> LENGTH: 27
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 30
 cgcggttggtg gatggcggct cccagcc 27

<210> SEQ ID NO 31
 <211> LENGTH: 32
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 31
 cgataccacc aagaaattga ccggtgtcac cc 32

<210> SEQ ID NO 32
 <211> LENGTH: 32
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 32
 cgataccacc aagccattga ccggtgtcac cc 32

<210> SEQ ID NO 33
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 33
 gggtgacaac ggtcaatggc ttggtggtat cg 32

<210> SEQ ID NO 34
 <211> LENGTH: 28
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <400> SEQUENCE: 34
 cgagacgtcg ggtgccatca accgatac 28

<210> SEQ ID NO 35
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
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 <400> SEQUENCE: 35
 cgagacgtcg ggtcccatca accgatac 28

<210> SEQ ID NO 36
 <211> LENGTH: 28
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 36
 gtatcggttg atgggacccg acgtctcg 28

<210> SEQ ID NO 37
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 <212> TYPE: DNA

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<213> ORGANISM: Artificial
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 <400> SEQUENCE: 37
 ggcgtcactt tccagcagcc caacgccgag cttgg 35

<210> SEQ ID NO 38
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 38
 ggcgtcactt tcccgcagcc ccccgccgag cttgg 35

<210> SEQ ID NO 39
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 39
 ccaagctcgg cggggggctg cgggaaagtg acgcc 35

<210> SEQ ID NO 40
 <211> LENGTH: 26
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 40
 ggctacctct ggcggcatgg ttctgg 26

<210> SEQ ID NO 41
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 <212> TYPE: DNA
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 <400> SEQUENCE: 41
 ggctacctct cccggcatgg ttctgg 26

<210> SEQ ID NO 42
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 42
 ccagaaccat gccgggagag gtagcc 26

<210> SEQ ID NO 43
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 43
 gcggaagctg ctccaccagc tccggtgtcc ctgc 34

<210> SEQ ID NO 44
 <211> LENGTH: 34
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
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 <400> SEQUENCE: 44
 gcggaagctg ccccaccagc cccggtgtcc ctgc 34

<210> SEQ ID NO 45
 <211> LENGTH: 34
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 45
 gcagggacac cggggctggt ggggcagctt ccgc 34

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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 46
 gtctcccaac gccaaagtca cc 22

<210> SEQ ID NO 47
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 47
 gtctcccaac cccaaggtca cc 22

<210> SEQ ID NO 48
 <211> LENGTH: 22
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 48
 ggtgaccttg ggggtgggag ac 22

<210> SEQ ID NO 49
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 49
 ggcagcaccg gcaaccctag cggcggcaac cc 32

<210> SEQ ID NO 50
 <211> LENGTH: 32
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 50
 ggcagcaccg gccccctcc cggcggcaac cc 32

<210> SEQ ID NO 51
 <211> LENGTH: 32
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<213> ORGANISM: Artificial
 <220> FEATURE:
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 <400> SEQUENCE: 51
 gggttgccgc cgaggagggg gccggtgctg cc 32

<210> SEQ ID NO 52
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <400> SEQUENCE: 52
 ggctttgtca cccagtctgc gcagaagaac gttggc 36

<210> SEQ ID NO 53
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
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 ggctttgtca cccagggtgc gcagaagaac gttggc 36

<210> SEQ ID NO 54
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 gccaacgttc ttctgcgac cctgggtgac aaagcc 36

<210> SEQ ID NO 55
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial
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 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 55
 ccgataacag atatggcggc 20

<210> SEQ ID NO 56
 <211> LENGTH: 20
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 56
 ccgataacgc ctatggcggc 20

<210> SEQ ID NO 57
 <211> LENGTH: 20
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 57
 gccgcatag gcgttatcgg 20

<210> SEQ ID NO 58
 <211> LENGTH: 30
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 58
 cccggtgccg tgcgcggaag ctgctccacc 30

<210> SEQ ID NO 59
 <211> LENGTH: 30
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 59
 cccggtgccg tggccggaag ctgctccacc 30

<210> SEQ ID NO 60
 <211> LENGTH: 30
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 60
 ggtggagcag cttccggcca cggcaccggg 30

<210> SEQ ID NO 61
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 61
 gctgaggagg cagaattcgg cggatcctct ttctc 35

<210> SEQ ID NO 62
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 62
 gctgaggagg cagaagccgg cggatcctct ttctc 35

<210> SEQ ID NO 63
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primewr for PCR
 <400> SEQUENCE: 63
 gagaaagagg atccgccggc ttctgcctcc tcagc 35

<210> SEQ ID NO 64
 <211> LENGTH: 29
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 64
 ggaaccata cgcctgggc aacaccagc 29

<210> SEQ ID NO 65
 <211> LENGTH: 29
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 65
 ggaaccata cgccctgggc aacaccagc 29

<210> SEQ ID NO 66
 <211> LENGTH: 29
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 66
 gctggtgtg cccagggcgt atgggttcc 29

<210> SEQ ID NO 67
 <211> LENGTH: 34
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 67
 cctaccgcac aaacgagacc tcctccacac ccgg 34

<210> SEQ ID NO 68
 <211> LENGTH: 34
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 68
 cctaccgcac aaacgccacc tcctccacac ccgg 34

<210> SEQ ID NO 69
 <211> LENGTH: 34
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 69
 ccgggtgtgg aggaggtggc gtttgtcggg tagg 34

<210> SEQ ID NO 70
 <211> LENGTH: 32
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 70
 ggactcacgc tacggccagc agcacgaact gc 32

<210> SEQ ID NO 71
 <211> LENGTH: 32
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 71
 gcagttcgtg ctgctggccg tagcgtgagt cc 32

<210> SEQ ID NO 72
 <211> LENGTH: 32
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 72
 ggactcacgc tacgaacagc agcacgaact gc 32

<210> SEQ ID NO 73
 <211> LENGTH: 36
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 73
 cccataccgc ctgggcgcca ccagcttcta cggccc 36

<210> SEQ ID NO 74
 <211> LENGTH: 36
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 74
 gggccgtaga agctggtggc gccagggcgg tatggg 36

<210> SEQ ID NO 75
 <211> LENGTH: 36
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 75
 cccataccgc ctgggcaaca ccagcttcta cggccc 36

<210> SEQ ID NO 76
 <211> LENGTH: 41
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 76
 ggactccacc tacccgacag ccgagacctc ctccacacc g 41

<210> SEQ ID NO 77
 <211> LENGTH: 41
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 77
 cgggtgtgga ggaggtctcg gctgtcgggt aggtggagtc c 41

<210> SEQ ID NO 78
 <211> LENGTH: 41
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 78
 ggactccacc tacccgacaa acgagacctc ctccacacc g 41

<210> SEQ ID NO 79
 <211> LENGTH: 23
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 79
 gctgaggagg cagaattcgg cgg 23

<210> SEQ ID NO 80
 <211> LENGTH: 23
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 80
 gctgaggagg cacgcttcgg cgg 23

<210> SEQ ID NO 81
 <211> LENGTH: 23
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 81
 ccgccgaagc gtgcctcctc agc 23

<210> SEQ ID NO 82
 <211> LENGTH: 27
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 82
 ggcaacgagc tcaacgatga ttactgc 27

<210> SEQ ID NO 83
 <211> LENGTH: 27
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 83
 ggcaacgagc tcgacgatga ttactgc 27

<210> SEQ ID NO 84
 <211> LENGTH: 27
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 84
 gcagtaatca tcgtcgagct cgttgcc 27

<210> SEQ ID NO 85
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 85
 ccggtgtccc tgctcaggtc gaatctcagt ctccc 35

<210> SEQ ID NO 86
 <211> LENGTH: 35
 <212> TYPE: DNA

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<213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 86
 ccggtgtccc tgatcaggtc gaatctcagt ctccc 35

<210> SEQ ID NO 87
 <211> LENGTH: 35
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 87
 gggagactga gattcgacct gatcagggac accgg 35

<210> SEQ ID NO 88
 <211> LENGTH: 30
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 88
 gctcaggtcg aatctcagtc tcccaacgcc 30

<210> SEQ ID NO 89
 <211> LENGTH: 30
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 89
 gctcaggtcg aatctcagtc tcccaacgcc 30

<210> SEQ ID NO 90
 <211> LENGTH: 30
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 90
 ggcgttgga gagcgagatt cgacctgagc 30

<210> SEQ ID NO 91
 <211> LENGTH: 29
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 91
 ccctatgtcc tgacaacgag acctgcgcg 29

<210> SEQ ID NO 92
 <211> LENGTH: 29
 <212> TYPE: DNA
 <213> ORGANISM: Artificial
 <220> FEATURE:
 <223> OTHER INFORMATION: Primer for PCR
 <400> SEQUENCE: 92
 ccctatgtcc tgacgacgag acctgcgcg 29

<210> SEQ ID NO 93
 <211> LENGTH: 29
 <212> TYPE: DNA

Seq Listing 2-7-07.txt

<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 93
cgcgccaggtc tcgtcgtcag gacataggg 29

<210> SEQ ID NO 94
<211> LENGTH: 44
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 94
gctcgaccct atgtcctgac aacgagacct gcgcgaagaa ctgc 44

<210> SEQ ID NO 95
<211> LENGTH: 44
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 95
gctcgaccct atgtcctgac gacgagacct gcgcgaagaa ctgc 44

<210> SEQ ID NO 96
<211> LENGTH: 44
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: Primer for PCR
<400> SEQUENCE: 96
gcagttcttc gcgcaggtct cgtcgtcagg acatagggtc gagc 44